REGULATORY APPROACHES TO REDUCE PARTICULATE MATTER EMISSIONS FROM

TRANSPORT REFRIGERATION UNITS



November 19, 2002



Overview

- Update on TRU and TRU generator set emissions inventory
- Action to-date
- Summary of last TRU ATCM proposal
- New TRU ATCM proposal
- Regulatory development schedule
- Contacts

Update TRU and TRU Gen Set Emissions Inventory

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TRU Emission Inventory

Revisions to the Diesel Transport Refrigeration Units (TRU) and related Generator Set Emissions Inventory

November 2002

TRU Emission Inventory Background

TRU and Generator Set emissions are estimated in ARB's OFFROAD Model.

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TRU Emission Inventory

The inventory in tons per day is calculated using the following equation:

Inventory= Emission Rate* Population*
Activity* Avg. Horsepower*
Load Factor

Emission rate by pollutant in gms/hp-hr Activity is in hrs/yr or hrs/day

Sources for Existing Input Factors:

Population - Power Systems Research Activity - Power Systems Research Load Factor- Power Systems Research Horse Power - Power Systems Research Emission Factors - Engine Test Data

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TRU Emission Inventory

Reasons for Revision:

Recently more up to date population and activity estimates were obtained through TRU Manufacturers.

We thank Manufacturers for their valuable input.

Sources for Proposed Input Factors:

Population - Manufacturer's data
Activity - Manufacturer's data
Load Factor- Manufacturer's data
Horse Power - Manufacturer's data
Emission Factors - Engine Test Data

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TRU Emission Inventory

2000 Fleet Average Emission Rates for Proposed Inventory

gms/hp-hr

	<u>PM</u>	<u>NOx</u>	
<15 HP	0.66	8.96	
15-25HP	0.57	6.61	
25-50 HP	0.96	7.01	

Statewide - 2000

	<u>Existing</u>	Proposed
Population	40831	53403
PM (tpd)	2.60	3.06
NOx (tpd)	25.68	23.81

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TRU Emission Inventory

Statewide 2000 <15 HP

<u>E</u> >	<u>kisting</u>	<u>Proposed</u>
Population	0	11363
Average HP	NA	10
Activity (hrs/yr)	NA	1038
Load Factor	NA	0.64
PM (tpd)	NA	0.15
NOx (tpd)	NA	2.04

Statewide 2000 15-25 HP

	Existing	<u>Proposed</u>
Population	1517	5142
Average HP	17	17
Activity (hrs/yr)	750	1038
Load Factor	0.50	0.64
PM (tpd)	0.01	0.10
NOx (tpd)	0.11	1.16

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TRU Emission Inventory

Statewide 2000 25-50 HP

	Existing	Proposed	
Population	8412	36891	
Average HP	39	34	
Activity (hrs/yr) 1341	1465	
Load Factor	0.28	0.53	
PM (tpd)	0.43	2.81	
NOx (tpd)	2.80	20.61	

Statewide 2000 >50 HP

<u>E</u>	Existing	<u>Proposed</u>
Population	30902	0
Average HP	56	NA
Activity (hrs/yr)	1340	NA
Load Factor	0.28	NA
PM (tpd)	2.17	NA
NOx (tpd)	22.78	NA

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TRU Emission Inventory

TRU's DIESEL GEN SETS

Currently all Gen Sets are included in the Commerical Category of the OFFROAD Model.

Sales Data along with other activity factors specific to TRU Gen Sets were obtained from TRU Gen Set Mfg's.

TRU's DIESEL GEN SETS

Statewide - 2000 25-50 HP

	Existing (all)	Proposed (TRU)
Population	4548	2750
Avg. HP	33	31
Activity	338	1100
Load Factor	0.74	0.40
PM (tpd)	0.08	0.11
NOx (tpd)	0.75	0.80

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TRU ATCM Action To-Date

- 6th TRU Workgroup meeting
- Four Special TRU Electrification Workgroup meetings
- 3 Public Workshops
- Established Control Technology Matrix
- Provided draft TRU regulation language
- Completed information gathering
 - ◆ TRU and TRU generator set manufacturers
 - ◆ TRU engine manufacturers
 - ◆ Emission control system manufacturers
- Completed 24 facility visits
- Collected preliminary cost data for alternative technologies

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- Working on demos
- Evaluating test-cycle issue
- Gathering information on gen sets
- Learning about intermodal facilities
- Researching e-technologies for recordkeeping and reporting

May 5th TRU ATCM Concept Summary

- TRU Manufacturers
 - ◆ New TRUs to be equipped with electric standby (E/S)
- Fleet Owners/Operators Phased reqmnts
 - + Replace in-use TRUs with new TRUs equipped with E/S,
 - Retrofit in-use TRUs to reduce PM emissions by 75% or to less than 0.15 g/bhp-hr, or
 - + Retrofit in-use TRUs with E/S
- Facility requirements
 - + Provide electric power infrastructure
 - + Prohibit diesel TRU operations at facility, if E/S-equipped

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New TRU ATCM Concepts

New Overall Approach

- Focus on both near-source risk reductions and mass reductions
- Provide more options and flexibility
- Phase in requirements over longer-term
- Provide opportunities for early emission reductions

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Engine Manufacturers

- Progressively more stringent new TRU engine standards
 - ♦ 0.30 g/bhp-hr by 2005 or earlier
 - ♦ 0.10 g/bhp-hr by 2010 or earlier
 - ♦ 0.01 g/bhp-hr by 2015 or earlier
 - → This is the "clean" diesel target

Issues with Engine Standards

- Harmonization with U.S. EPA standards
- May need adjustments to test cycle for TRU and TRU gen set engine certification
- Technology issues may exist for final "clean" diesel target

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TRU/TRU Gen Set Fleets

- Required to steadily reduce emissions from older in-use TRUs and gen sets choose from a variety of compliance options:
 - Retrofit with verified diesel emission control strategy that meets the highest verification classification level that has been verified, or
 - Use a qualified alternative technology, or
 - ◆ Replace in-use engine with <u>new</u> certified engine

TRU/TRU Gen Set Fleets (cont'd)

- Verification classification levels for diesel PM emission control strategies (retrofit)
 - ◆ Level 1 ≥25% reduction
 - ◆ Level 2 >50% reduction
 - ◆ Level 3 >85% reduction or 0.01 g/bhp-hr

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TRU/TRU Gen Set Fleets (cont'd)

- Alternative technologies:
 - ◆ Electric standby,
 - ◆ Cryogenic temperature control (or hybrid),
 - ◆ Alternative-fueled engines,
 - ◆ Alternative-diesel-fueled engines,
 - ◆ Fuel cells, or
 - ◆ Any other system approved by EO not to emit diesel PM while at affected facility.

TRU/TRU Gen Set Fleets (cont'd)

■ Compliance dates

Model Year	Percent Compliance	Compliance Date
Pre-1996	33%	31-Dec-05
	67%	31-Dec-06
	100%	31-Dec-07
1996-2004	33%	31-Dec-08
	67%	31-Dec-09
	100%	31-Dec-10

- 2005 and subsequent model years
 - ◆ Comply 5 years after end of model year
 - ◆ Example MY 2005 by 12-31-10

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TRU/TRU Gen Set Fleets (cont'd)

■ Labeling

- Quick & easy means of identifying equipment that is in compliance with retrofit/replace/alternative technology requirements
 - + Visual indication
 - ◆ Bar code or other technology

Facilities

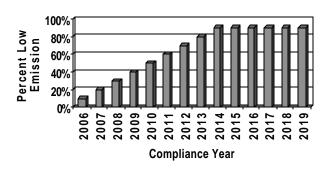
- Phase-in infrastructure to support low emissions TRUs/TRU gen sets
- Increase numbers of low-emission TRUs/TRU gen sets at facility by 10% per year
 - ♦ 10% in 2006,
 - ◆ Level off at 90% in 2014 and beyond.

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Facilities (cont'd)

■ Example

Phase-In of Low Emission TRUs/TRU Gen Sets at Facility



Facilities (cont'd)

- Compliance achieved by:
 - ◆ Increasing the number of active TRUs/TRU gen sets operating under low emission technologies while at an affected facility
 - ◆ Low emission technologies meeting facilityqualifying criteria and limitations may be counted toward compliance

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Facilities (cont'd)

- Facility-qualifying low emission technologies:
 - ◆ TRUs/TRU gen sets equipped with "clean" diesel engines
 - → Engines certified to 0.01 g/bhp-hr PM, or
 - → Engines retrofitted to Level 3 Verification Level
 - ◆ TRUs operating on electric standby only,
 - ◆ TRUs operating on cryogenic temperature control systems (may be hybrid),

Facilities (cont'd)

- Facility-qualifying low emission technologies (cont'd)
 - ◆ Equipped with alternative-fueled engines,
 - Engines fueled exclusively with alternative diesel fuel,
 - ◆ TRUs powered by fuel cells, or
 - ◆ Equipped with technology that prevents diesel engine from running while at affected facility, except during an emergency.

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Fuel Requirements

- TRUs/TRU gen sets shall use fuel that is lawful for use or sale in California as vehicular fuel (CARB diesel).
- Fleet operators opting to use alternative diesel fuel -
 - ◆ Recordkeeping and reporting to show exclusive use of alternative-diesel fuel.
- Fuel tank labeling requirements
 - ◆ Prevent miss-fueling

Monitoring, Recordkeeping & Reporting

- Fleet owner/operators
 - ◆ Initial report due June 30, 2004:
 - Contact information
 - Basic TRU/TRU gen set fleet inventory information
 - · Compliance plan
 - ◆ Annual reporting due January 31st each year (starting 1/31/06):
 - Update basic TRU/TRU gen set fleet inventory info.
 - · Report implementation steps taken
 - · Compliance plan amendments

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Monitoring, Recordkeeping & Reporting (cont'd)

- Fleets opting to use alternative-diesel fuel or fuel additives
 - Annual report due January 31st and subsequent years (starting 1/31/06)
 - Annual fuel use and/or additive use for prior year
 - → TRU hours of operation for prior year

Monitoring, Recordkeeping & Reporting (cont'd)

■ Facilities

- Monitor and maintain continuous record of:
 - · Number of reefers at facility at any time
 - Number and percent meeting low-emission facilitycompliance criteria
- ◆ Initial report due June 30, 2005
 - · Contact information
 - · Compliance plan
- ◆ Annual report due January 31st each year (starting 1/31/07)
 - · Implementation steps taken
 - Amendments to compliance plan

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Monitoring, Recordkeeping & Reporting (cont'd)

- Alternative compliance plans
 - In event fleet or facility cannot comply for good cause
 - → Financial hardship
 - + Supplier unable to deliver
 - ◆ Request compliance date extension
 - ◆ Provide circumstances, rationale, documentation

Summary

- Requirements for
 - ◆ TRU and TRU Engine Manufacturers
 - ◆ Fleets
 - ◆ Facilities
 - ◆ Fuels
 - ◆ Monitoring, Recordkeeping, & Reporting
- Structure designed to encourage early "clean" diesel engines

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Schedule

- Next Public Workshop: Mid-February
- Tentative Board Hearing: 3Q 2003

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